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IS THERE A MOTHERHOOD PENALTY?: DECOMPOSING THE FAMILY WAGE GAP IN COLOMBIA

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Is There a Motherhood Penalty?: Decomposing the family wage gap in Colombia*

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Abstract

The aim of this paper is to provide an estimation and decomposition of the motherhood wage penalty in Colombia. Our empirical strategy is based on the matching procedure designed by Ñopo (2008) for the case of gender wage gaps. This is an alternative procedure to the well-known Blinder-Oaxaca decomposition method. The cross-section data of the Colombian Living Standard Survey allows us to decompose the wage gap in four components, according to the characteristics of mothers and non-mothers. We found that mothers earn, in average, 1.73% less than their counterparts without children and that this gap slightly decreases as the group includes older women. Taking into account that this procedure is sensitive to the set of variables included in the matching, several specifications are tested. The main result of the paper is obtained when considering schooling as a matching variable. Once schooling is included, the unexplained part of the gap considerably decreases and turns non significant. Thus, we do not find evidence of wage discrimination against mothers in the Colombian labor market.

JEL: J31, J16

Key Words: Family Wage Gap, Childbearing Costs, Female Wages.

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1 Introduction

One of the most important choices faced by individuals is whether to have a family or not. This choice implies to take into account several aspects such as future investments in human capital, the entry and exit of parents from the labor market, changes in consumption patterns, among others. In a traditional couple, getting married and having children do not have the same effect for women than for men. Nowadays, and during most of the last century, women are occupied in some other issues besides marrying and childbearing. They usually combine family life with professional life, as men have always done. This new role for women may imply a *trade-off* between human capital investments and the number of children. It may also imply a trade-off between cumulative labor experience and the number of children.

There is evidence in the literature showing that certain family decisions may affect labor market outcomes of women - wages and working time - more than those outcomes of men (See for instance **Lundberg and Rose (2002)**). Although work and family responsibilities can be done simultaneously, the fact is that, on average, mothers spend more time with their children than fathers do. Women, after childbearing, usually stay longer out of the job market compared to men, which may affect their cumulative experience, job training and wages. In fact, childbearing may cause that mothers have to seek for another job more flexible in time, which gives them a penalty in their experience and salary. In the literature, there is a variety of explanations for the existence of this gap. These explanations range from the existence of unobserved heterogeneity, discrimination, and institutional features, to intermittences in jobs and less continuos labor tenure (see **Waldfogel** (1997), **Anderson** et al. (2003) and **Amuedo-Dorantes and Kimmel** (2008)).

Additionally, there are empirical studies comparing labor participation and wages of mothers and non-mothers. Their main interest is to find out if there is a "family gap" between these two groups of women (**Angrist and Evans** (1998), **Cruces and Galiani** (2007), **Peña and Olarte** (2011), **Budin and England** (2001) among others). Most of the studies find, after controlling by socioeconomic characteristics of women, that there is a statistically significant gap in favor of non-mothers. However, in the opposite side, others as **Piras and Ripani** (2005) provide no conclusive evidence for different countries in Latin-America.

The purpose of this paper is to provide new evidence about the existence of gaps in wages between women with and women without children for the case of Colombia. To the best of our knowledge, this is an aspect that has only been studied by means of Mincerian equations without recognizing the existence of particular differences between the individuals in their characteristics' distribution. In this sense, the contribution of this paper is twofold. First, we use a non -parametric approach which allows us to have an accurate idea of the actual differences between mothers and no-mothers in their labor earnings. This approach, designed by Ñopo (2008) for the study of gender wage gaps, has the advantage of providing a gap's decomposition according to the set of

common characteristics that are included in a matching procedure. Second, given that there is mixed evidence about the existence of penalty or premium of motherhood in the literature for different countries, we want to contribute with additional evidence for a developing country such as Colombia. As **Waldfogel (1997)** states, while the gender wage gap has fallen in recent years, the motherhood wage gap has actually increased. Thus, it is interesting to deepen in the origin of this wage penalty, which is done here using the Ñopo's decomposition method.

The structure of the paper is as follows. Section 2 briefly summarizes some of the previous contributions to study the effect of childbearing on the labor market participation and female wages. Section 3 describes the empirical strategy adopted in the paper, which is based on the previous work by **Ñopo** (2008). Section 4 shows some descriptive analysis using data from the Colombian Living Standard Survey from 2008, carried out by the National Department of Statistics (*Departamento Administrativo Nacional de Estadistica, DANE*). Section 5 presents the results of our estimations and, finally, section 6 concludes.

2 Literature Review

Since the paper from **Hill (1979),** there have been numerous contributions dealing with empirical evidence of children penalty in labor markets (lower wages) for mothers. The factors behind this so-called family gap could be different from those which are behind gender gaps. Therefore, it is interesting to study this issue in depth, also because there is much less evidence in the case of motherhood gaps than in the case of gender gaps. We start by reviewing papers that analyze labor-market penalties of motherhood using data from developed countries. Afterwards, we include papers showing empirical evidence for Latin-American countries. For Colombia, to the best of our knowledge, there is only one more paper by **Peña and Olarte (2011)** dealing with the topic. They work with the same database that we do, however, they use a different methodology of estimation, decomposition and analysis of the gap. The paper is reviewed at the end of this section.

The relationship between fertility and labor participation has received notorious attention because of its implications on several dimensions of human life. However, there is a complex link between them in empirical exercises. The existence of endogeneity is one of the reasons that have justified so many changes in methodological approaches followed in this field. **Angrist and Evans (1998)** propose a set of instruments to deal with the endogeneity of fertility when modelling the effect of childbearing on parents labor supply. Those instruments are related to the parents' preference for mixed-sex children. Specifically, having two children of the same sex increases the probability of bearing a third child. In addition, the authors explore using twin births as an instrument. They employ US census databases from 1970, 1980 and 1990. The sample is restricted to mothers from 21 to 35 years old, whose oldest child is less than 18. The instrumented fertility variable is "*more than two children*".

Their results show that women with two children of the same sex or whose second birth were twins have lower probability of working, work fewer hours, and have lower earnings and family income. Having more than two children reduces labor supply by 6.4 weeks a year, 5.2 weekly hours worked, and slightly reduces wages. In contrast to previous evidence, according to which labor supply effects are larger for high educated women, **Angrist and Evans (1998)** find that childbearing has a higher effect on the labor outcomes of low educated women, as well as poor women. The authors conclude that "even though childbearing clearly affects labor supply, the increase in female labor-force participation has been so large that declining fertility can explain only a small fraction of the overall change" (page 474).

Other studies have exclusively focused on the wage differences between mothers and non-mothers. **Budin and England (2001)** analyze motherhood wage penalty by using fixed-effects models. The data corresponds to the US National Longitudinal Survey of Youth (1982-1993). Their results show a 7% wage penalty per child, being larger for married women than for unmarried women. Given the lower job experience of women with more children, the authors control for this factor and obtain a significant 5% wage penalty per child. The penalty is partially explained because mothers have a higher probability of working part-time. However, there is still an unexplained part of wage penalty which, according to the authors, might probably be due to a possible negative impact of childbearing on productivity and discrimination against women with children.

Anderson et al. (2003) use the US National Longitudinal Survey of Young women (1968-1988) to examine the wage penalty of mothers compared to non-mothers, finding that human capital characteristics and unobserved heterogeneity explain 55%-57% of the gap. The authors are interested in exploring differences in the wage gap among mothers with different skill levels. They find that medium-skilled mothers (high school graduates) experience longer and higher wage losses from motherhood than both low-skilled and high-skilled mothers. According to the authors, time constraints are the explanation of the existence of this higher gap, since high school graduates women most probably will get a job with no time flexibility, this is, with compulsory presence during office hours. If this is true, medium-skilled mothers would be more willing to accept lower wages in order to gain some flexibility. They also find that the highest wage gap exists when women first return to work. The penalty reduces as time passes, at a slower pace in the case of medium-skilled mothers.

For seven industrialized countries (Germany, Australia, Canada, Finland, USA, the UK and Sweden), **Harkness and Waldfogel (2003)** analyze the effect of marriage and the age of children on the labor supply and wages of women. The authors found differences in the results among countries. The effect of children on wages is higher in the UK than in the rest of countries because women tend to participate in bad paid and part-time jobs. On the contrary, the impact on wages of mothers from Nordic countries is the lowest.

In the empirical evidence for Latin-American countries, we have the works of Cruces and Galiani (2007), Piras and Ripani (2005) and Peña and Olarte

(2011). **Cruces and Galiani (2007)** use the instruments proposed by Angrist and Evans (1998) - same-sex children and twins -, in order to explore the effect of fertility on maternal labor supply in Mexico and Argentina. The authors restrict the sample to women between 21 and 35 with at least two children, and an oldest child at most 18 years old, excluding those whose second child is younger than one year. According to them, female labor supply is lower for married women than for single (both countries). In Mexico, the average number of children for married women (3.03) is higher than in Argentina (2.98). In the first stage of a two-step procedure, they find that having two "same-sex" children increases the probability of bearing more than two children, even more in the case of two girls. Instrumental variables results show that having more than two children reduces mothers' labor supply by 8.1 to 9.6 percentage points in Argentina and 6.3 to 9.6 percentage points in Mexico.

A paper finding mixed evidence on children wage penalty for different Latin-American countries is the one by **Piras and Ripani (2005)**. They calculate the cost of motherhood in terms of salaries and labor supply for Bolivia, Brazil, Ecuador and Peru. The authors were motivated by the evidence from previous studies: while the gender wage gap has been narrowing, the gap between mothers and non-mothers is increasing. Besides, men do not seem to suffer children penalty. The authors restrict the sample to women from urban areas between 14 and 45 years old who are not self-employed.

They find that young mothers (14 to 25 years) participate more in the labor market than young non-mothers, which is expected because of the need of the first group to finance the children. The opposite is true for older cohorts. Besides, dividing the sample into married and unmarried, mothers of the second group work more than unmarried mothers: "female participation rates increases with age and decreases with family responsibilities". The evidence of the existence of wage premium or penalty for motherhood is different among countries. For Bolivia, results reveal a wage premium for having children from 13 to 18 years old. For Brazil, the premium is for having children younger than seven years. On the contrary, results from Peru reveal the existence of a penalty of motherhood and those from Ecuador were not significant. The authors do not correct by selection bias.

Finally, **Peña and Olarte (2011)** analyze the impact of children on women wages using the Colombian Living Standard Survey of 2008. They seek to explore, as we do, the existence of a 'family gap' or wage penalty for maternity in Colombia. The authors use cross-section analysis correcting by selection bias, and restrict the sample to women between 18 and 65 years, living in urban areas and reporting a wage higher than one dollar per day. From the data, they observe that there is self-selection in the entrance of women to the labor market: female workers are younger, have fewer children in average, have lower non-wage income, and are more educated. Among those female workers, mothers are older, less educated, obtain less wage per hour, live more often in couples, are more often the head of the household, and have more responsibilities in the house than non-mothers.

After correcting the selection bias and controlling for observable factors such

as human capital, household structure, and region, there is still a wage differential of 9.4%, which increases for women with children from 0 to 5 years old (18.4%). Being a mother increases the probability of belonging to the health subsidized regimen, and being engaged on low quality jobs, especially for those with children under 5 years old.

Let us recall that there are no contributions, previous to this paper, using the Ñopo's wage gap decomposition for Colombia or any other country, for the case of motherhood penalty.

3 Methodology

Most of the papers analyzing wage gaps (gender and family gaps), use Mincerian equations and the Blinder-Oaxaca decomposition to detect and explore further both gender and family wage gap. Those studies focused on differences in labor supply between mothers and non-mothers use instrumental variables to regress worked hours on endogenous fertility variables (As it is done in Angrist and Evans (1998) and Cruces and Galiani(2005)). This paper will use the methodology proposed by Ñopo (2008), which he and others have previously used to explore gender wage gaps.

The main advantage of Ñopo's method is that it deals with a potential problem in the Blinder-Oaxaca approach (already recognized in the case of gender analysis), namely, the existing differences in the support of characteristics for mothers and non-mothers.[1] For the Blinder-Oaxaca decomposition, the earning equations of the two groups should be estimated. A bipartition of the wage gap is done: one part of the gap is explained by differences in the average characteristics of women, and the second part is due to differences in the average rewards of these characteristics. The interesting part is the second one, which contains the effect of unobservable differences in characteristics between mothers and non-mothers, and potential discrimination of the labor market against (or in favour of) mothers. If there are differences in the supports of the distributions of characteristics for mothers and non-mothers, there will be combinations of characteristics for which it is possible to find non-mothers in the labor supply, but not mothers. One example is young non-mother, with university degree, working full-time, and non-self-employed. Likewise, there will be mothers in the labor supply who do not match in the non-mothers group. For instance, young mother, self-employed, and par-time worker.

Adapting Ñopo (2008) to our concerns, let us have two types of women: non-mothers (N) and mothers (M), who have certain socioeconomic characteristics denoted by x. Equations (1) and (2) stand for the expected value of earnings of N and M respectively,

[1] The support of a probability distribution is the closure of the set of possible values of a random variable having that distribution. That is, the set of points that belongs to the distribution.

$$E[Y|N] = \int_{S^N} g^N(x) dF^N(x) \tag{1}$$

$$E[Y|M] = \int_{S^M} g^M(x) dF^M(x) \tag{2}$$

where F^N and F^M are the cumulative distribution functions of women's characteristics, conditional on being non-mother or mother, and S^N and S^M correspond to the support of the distribution of characteristics for non-mothers and mothers respectively. The gap is defined by $\triangle = E[Y|N] - E[Y|M]$. Given that S^N and S^M are different, each integral of equations (1) and (2) is divided in two parts, within the intersection $(S^N \cap S^M)$ and out of the common support $(S^M \cap S^{\overline{N}},\ S^{\overline{M}} \cap S^N)$

$$\begin{aligned} \Delta \quad = \quad & \left[\int_{\overline{S^M} \cap S^N} g^N(x) dF^N(x) + \int_{S^N \cap S^M} g^N(x) dF^N(x) \right] \\ & - \left[\int_{S^N \cap S^M} g^M(x) dF^M(x) + \int_{S^M \cap \overline{S^N}} g^M(x) dF^M(x) \right] \end{aligned} \tag{3}$$

After some algebraic manipulation and redefinition of the integrals in equation (3), the gap is expressed as:[2]

$$\Delta = \Delta_N + \Delta_M + \Delta_x + \Delta_0 \tag{4}$$

where Δ_N is the part of the gap explained by the differences in characteristics between non-mothers out of the common support (unmatched non-mothers) and non-mothers in the common support (matched non-mothers). It is the weighted difference between the expected wages of non-mothers out of the common support minus the expected wages of non-mothers in the common support.

$$\Delta_N = \left[\int_{\overline{S^M}} g^N(x) \frac{dF^N(x)}{\mu^N(\overline{S^M})} - \int_{S^M} g^N(x) \frac{dF^N(x)}{\mu^N(S^M)} \right] \mu^N(\overline{S^M})$$

The weight, $\mu^N(\overline{S^M})$, is the probability measure of the set $\overline{S^M}$ under the distribution $dF^N(.)$ of non-mothers characteristics, or the probability measure (under the distribution of non-mothers characteristics) of the sets of characteristics that mothers do not reach. Analogous interpretations could be done for the case of $\mu^N(S^M)$.[3]

The second term, Δ_M, is the part of the gap that can be explained by the differences in characteristics between matched mothers and unmatched mothers. It is the weighted difference between the expected wages of mothers in the common support minus the expected wages of mothers out of the common support.

[2] See Ñopo (2008) to check the whole precedure.

[3] $\mu^N(\overline{S^M}) = \int_{\overline{S^M}} dF^N(x)$, $\mu^N(S^M) = \int_{S^M} dF^N(x)$

$$\Delta_M = \left[\int_{S^N} g^M(x) \frac{dF^M(x)}{\mu^M(S^N)} - \int_{\overline{S^N}} g^M(x) \frac{dF^M(x)}{\mu^M(\overline{S^N})} \right] \mu^M(\overline{S^N})$$

$\Delta_M(\Delta_N)$ would be zero either if all mothers (non-mothers) can be matched to non-mothers (mothers), or if all unmatched mothers (non-mothers) have similar averages wages than the matched mothers (non-mothers).

The term $\Delta_x$is the portion which can be explained by differences in the distribution of characteristics of non-mothers and mothers on the common support.

$$\Delta_X = \int_{S^N \cap S^M} g^N(x) \left[\frac{dF^N}{\mu^N(S^M)} - \frac{dF^M}{\mu^M(S^N)} \right](x)$$

Finally, Δ_0 is the unexplained part of the wage gap, this is, the part not due to differences in characteristics of women. If there exists discrimination between mothers and non-mothers, Δ_0 would capture this issue, as well as the existence of unobserved characteristics penalized or rewarded by the labor market. However, this method does not allows us to differentiate which proportion of the unexplained part of the gap corresponds to discrimination.

$$\Delta_O = \int_{S^N \cap S^M} \left[g^N(x) - g^M(x) \right] \frac{dF^M(x)}{\mu^M(S^N)}$$

The matching procedure summarized by Ñopo (2008) is a five-step algorithm. The first step consists of selecting one mother (with no replacement) from the sample. The second step, select all non-mothers having the same characteristics of the mother selected in step one. The third is to construct a synthetic non-mother with all women selected in step 2, with a wage equal to the average wage of the selected non-mothers. This allows us to match the synthetic non-mother to the original mother. The fourth step is to put the observations of the synthetic non-mother and the mother in their new samples of matched women. Finally, we repeat the fourth step until the whole original mothers sample is exhausted.[4]

As mentioned, Ñopo's approach solves the problem of missespecification for the differences in the supports of the distribution of women's characteristics. To motivate the relevance of considering this issue, the following table shows the percentage of mothers and non-mothers out of the common support as we add individuals' characteristics to the matching procedure.

It is clear, from table 1, that assuming that the linear estimators of the wage equations are also valid out of the supports of women characteristics for which they were estimated, is actually a strong assumption. This is the problem of the Blinder-Oaxaca decomposition that the Ñopo's methodology overcomes.

Finally, it is worth mentioning that we carried out the Inverse mill's test to detect selection bias. As we found evidence of selection problems, a Heckman correction was performed.

[4] This procedure could be done in statistical packages such as SAS and Stata. In fact, Ñopo provides a Stata program that allows us to do the whole matching procedure and gives the results of $\triangle$ and each of its components.

Table 1: **Percentage of Mothers out of the common support**

	No-mothers	Mothers
$Age(A) + Region(R)$	0.1	3.8
$Age + Reg + Full\ time(F)$	5.6	10.6
$A + R + FT + Self - employed(SE)$	10.2	20.1
$A + R + FT + SE + Couple(C)$	20.5	32.0
$A + R + FT + SE + C + Schooling\ level(SL)$	35.3	42.6
$A + R + SL$	6.3	28.6
$A + R + Sch + FT$	17.9	29.8
$A + R + Sch + FT + SE$	26.1	36.3

Source: Results of the Ñopo's matching procedure using data from the ECV 2008

4 Data and descriptive Statistics

We use the Colombian Living Standard Survey (ECV hereafter, for their Spanish initials), carried out by the National Department of Statistics - DANE- in 2008.[5] The survey inquires about housing conditions, access and quality of water, characteristics and composition of the household, health, characteristics of children less than 5 years old, education (to members 5 years old or more), employment, living conditions and household spending.

There are 8.562 women from 18 to 65 years old in the sample, for a population size of 9.7 millions. 69% of them have had one or more children, 48.6% of mothers have a job, about the same proportion of non-mothers, 48%. The sample is restricted to urban areas.

Table 2: **Characteristics of the sample**

Observations	Sample	Population Size	%
Mothers	6.008	6.749.086	69.4
Non-Mothers	2.644	2.970.220	30.6
Total Women	8.652	9.719.306	100.0

Source: ECV, 2008

Table 3 shows the logarithm of the average wage per hour for mothers and no mothers. As expected, mothers earn, in average, lower wages than women with no children. Although not reported on table 3, data reveals that the average wage decreases as the number of children increases, from 7.97 for non-mothers, to 7.4 for mothers with 5 children. For robustness, we show all the results for two different groups of age: 18-45 years and 18-65 years. The latter group

[5] This survey has been carried out since 1993 with other applications in 1997 and 2003. However, previous questionaries did not include specific questions about fertility that prevents us to make comparisons in time.

is included for comparability with the work of Peña and Olarte (2011). The differences among groups is very small though.

It is observed that, independently of the motherhood condition, hourly wage is slightly higher for those women working part time than for those working full time. In addition, the wage is higher for public employees than for private employees, with self-employed women getting the lowest hourly wage. The same patterns are observed for the separated samples of mothers and non-mothers.[6]

Comparing the wages of mothers and non-mothers, the first group has a lower average wage for both part time and full time workers, with a more important difference in the case of women working full-time. Likewise, self-employed and private employees mothers get lower wages than non-mothers in the same labor categories. This is not the case for female public employees, whose wages are not statistically different between mothers and non-mothers.

There are no differences in the observed patterns among different age groups.

Table 3: **Hourly wage (Log) of mothers and non-mothers**

	18 - 45 years	18 - 65 years
Part-time	7.96	8.03
Full time	7.94	7.96
Self Employed	7.55	7.59
Private employee	7.90	7.91
Public employee	8.68	8.80
Mothers	7.69	7.72
Part-time***	7.91	7.98
Full time***	7.87	7.90
Private Employee*	7.86	7.88
Public Employee	8.67	8.80
Self Employed***	7.49	7.51
Non-Mothers	7.84	7.86
Part time***	8.12	8.19
Full time***	8.09	8.09
Private Employee*	7.97	7.97
Public Employee	8.71	8.80
Self Employed***	7.84	7.85

Source: Own calculations based on ECV, 2008.
***p<0.001, **p<0.01, *p<0.05 Significance of the differences in wages, for each category of employment, between mothers and non-mothers

Table 4 contains information of the distribution of women according to different labor characteristics and schooling levels. The proportion of mothers work-

[6] However, the difference between the wage of mothers working full-time and those working part-time is not statistically significant. The same in the case of the wage difference between non-mothers working full-time and part-time.

ing part-time is higher than the proportion of non-mothers doing so. Similarly, the proportion of mothers working full time is lower compared to non-mothers. it is appealing that a higher proportion of mothers work overtime compared to non-mothers. This could be a consequence of the higher proportion of self-employed mothers: a third part of working mothers are self-employed,compared to only 18% in the case of non-mother workers. Another observed fact is that mothers are more likely to work in small firms than non-mothers. In addition, a higher proportion of non-mothers work in jobs from both public and private sector (72.9%), compared to wage-earning mothers (55.8%). This is expectable since mothers need jobs with more flexibility in order to carry out their child caring duties.

As for education, the highest schooling level reached by women with no children is significantly higher than the levels reached by mothers. This educational advantage of non-mothers is even clearer for the youngest group of age. While around 48% of mothers have carried out some superior studies (complete or not), around 60% of non-mothers have done the same. We will see in the next section, that education is the key factor explaining the family wage gap between women with and without children.

Table 4: **Women labor and schooling characteristics**

	18-45 years		18-65 years	
	M	N	M	N
Labor Characteristics				
Part-time	25.6	19.8	27.4	23.1
Full time	41.9	50.6	41.5	48.3
Over time	32.5	29.5	31.1	28.6
Small firm	62.2	47.6	62.6	52.8
Employer	1.9	1.0	2.2	1.4
Self-employed	32.9	18.1	34.6	24.6
Private employee	48.9	64.4	44.2	53.9
Public employee	6.9	8.5	8.7	10.2
Schooling level				
None	1.56	2.14	3.23	3.78
Primary	24.69	11.34	29.68	23.78
Secondary and high school	52.16	40.53	46.52	35.49
Technical	7.93	14.62	6.78	11.22
Technological	2.29	4.54	2.08	3.26
University with no Diploma	2.49	5.68	2.21	4.16
University with Diploma	7.39	15.84	7.32	13.47
Graduate with no Diploma	0.1	0.23	0.21	
Graduate with Diploma	1.39	5.08	1.97	0.02

Source: Own calculations based on ECV, 2008 M: mother; N:Non-Mother

Finally, table 5 shows an interesting fact: the proportion of women work-

ing does not differ from mothers and non-mothers. The differences are determined for the schooling level and not for the motherhood condition. In fact, the proportion of women working increases with the schooling level for both groups.

Table 5: **Labor characteristics by schooling level18-65**

	Total	PI	PC	S	U
Mothers					
Working	52%	39%	45%	58%	82%
Not working	48%	61%	55%	42%	18%
	100	100	100	100	100
No mothers					
Working	52%	31%	42%	55%	79%
Not working	48%	69%	58%	45%	21%
	100	100	100	100	100

Notes: PI: primary incomplete, PC: primary complete, S: secondary, U: some superior education.
Source: Own calculations based on ECV, 2008

5 Results

The Ñopo's matching wage gap decomposition method was applied to obtain the wage differential between mothers and non-mothers. The inverse Mill's ratio revealed the existence of a selection bias, therefore, we dealt with the problem by using the Heckman correction.[7] Results show that women with no children earn, on average, 1.73% more than mothers. The gap decreases as the age group includes older women. Each column of table 6 corresponds to the results of the gap decomposition with different matching variables. We start the matching using the age of the woman and region where she lives (column 1). The next column incudes the previous matching variables and, in addition, "full-time" - a variable indicating if the woman works full or partial time. Column 3 considers the previous variables plus "self-employed", a dummy equals to 1 if the woman works by her own. Column 4 and 5 adds "couple" - if the woman has a partner or if she is single- and schooling level, respectively.

There is a very remarkable result which is, in our concept, the most important result of this paper: schooling is the key variable affecting the size of the unexplained part of the gap (ΔO). We see on the first four columns that ΔO is even higher than the total gap, except when we add schooling level as a matching variable, where this part considerably decreases and becomes non significant. To see how powerful the schooling level is in determining the result, we change the order of adding the matching variables. Column 1$'$ includes age, region and

[7] The estimations before correcting the selection bias are shown in the appendix.

schooling level only. Columns $2'$ and $3'$ add full-time and self-employed respectively. Once schooling is considered, the unexplained part of gap decreases and turns non significant. Recalling that certain part of ΔO can be attributed to discrimination, we could not say that there is evidence of discrimination against mothers in Colombia. Furthermore, as ΔO decreases, ΔX increases, the part of the gap explained by differences in the distribution of characteristics of mothers and non-mothers.

Taking schooling into account also increases ΔN, the part of the gap existing because there are some combinations of characteristics of non-mothers that mothers do not reach. This means that the expected wage of unmatched non-mothers is higher than the expected wage of matched non-mothers. This seems consistent with the differences in schooling levels between these two groups that can be seen on figure 1: while the 26% of unmatched non-mothers has some superior studies, only 13% of matched non-mothers has this schooling level.

Besides schooling, another factor that might be driving the results is that mothers may have lower elasticity of labor supply compared to non-mothers, which make them willing to accept lower wages jobs, if they are more time flexible. By doing so, they could spend more time with their children. In fact, there is a high proportion of mothers working as self-employed, which usually offers lower wages: while the average wage of self-employed female workers is around 456 thousand of pesos, for employees is 796 thousand. This would mean that mothers self-select in lower paid jobs.

Nonetheless, the data shows that mothers have lower levels of education than non-mothers (see table 4), which implies that they have less probability to engage in a well paid job compared to women without children. So, it is not only that they may exchange flexibility for better paid jobs, but also, their capacity to aspire to high wages jobs is limited, given their lower schooling achievements.

We have tried a different arrangement of the matching variables shown on the third panel of table 6. It is interesting to check that the variable region plays an important role in determining the percentage of women out of the common support. However, the main results pointed out from the estimations of panel 1 and 2 do not change.

It is worthwhile to check the characteristics of women in the common support compared to those out of the common support, this is, women that can be matched and those who can not (using the whole group of matching variables listed on table 6). Figure (1) shows some characteristics for the four relevant groups: matched mothers (M-in), unmatched mothers (M-out), matched no mothers (N-in) and unmatched no mothers (N-out). According to the first panel, mothers out of the common support are older than those who could be matched, while a big proportion of unmatched no mothers belong to the youngest groups of age. The second panel reveals that a good part of unmatched non-mothers are high-educated, while unmatched mothers have lower education levels. This is consistent with the results of the wage gap decompositions described before and shown on table 5. As for the third panel, it shows that most of the matched women (mothers or non-mothers) work full-time. Finally, although not appearing on figure (1), the data suggests that the proportion of self-employed

Table 6: **Results of the matching wage gap decomposition**

				18 - 45 years				
	A& R	+ FT	+SE	+C	+SL	A,R & SL	+ FT	+SE
	(1)	(2)	(3)	(4)	(5)	(1')	(2')	(3')
Gap	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73
ΔO	3.98	1.76	1.82	1.75	0.69	0.04	0.45	0.59
	(0.17)	(0.40)	(0.45)	(0.71)	(0.75)	(0.22)	(0.67)	(0.72)
ΔN	.	−0.07	−0.07	0.34	1.88	0.49	0.84	1.16
ΔM	0.02	−0.14	−0.28	−1.09	−1.71	0.49	−0.72	−0.95
ΔX	−2.27	0.18	0.26	0.73	0.85	0.70	1.15	0.93
%N	100	94.28	89.60	79.00	64.25	94.77	82.94	74.80
%M	96.81	89.97	80.31	66.53	55.74	69.82	69.63	63.12
				18 - 65 years				
Gap	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56
ΔO	3.15	1.44	1.69	1.62	0.71	0.06	0.49	0.67
	(0.15)	(0.31)	(0.35)	(0.59)	(0.61)	(0.19)	(0.55)	(0.58)
ΔN	−0.00	−0.01	−0.01	0.43	2.01	0.58	1.08	1.35
ΔM	0.02	−0.26	−0.50	−1.18	−1.86	0.09	−0.99	−1.25
ΔX	−0.05	0.38	0.38	0.69	−0.69	0.81	0.97	0.78
%N	99.9	94.4	89.8	79.46	64.65	93.68	82.12	73.90
%M	96.2	89.4	79.9	68.03	57.42	71.43	70.20	63.74
	A& FT	+SE	+C	+SL	+R	A & SL	+ FT	+SE
ΔO	2.09	1.95	1.73	0.54	0.71	0.37	0.35	0.33
	(0.14)	(0.14)	(0.18)	(0.34)	(0.68)	(0.15)	(0.20)	(0.22)
ΔN	.	−0.05	−0.05	0.45	2.01	0.07	0.10	0.22
ΔM	0.01	0.00	0.00	−3.52	−1.86	−0.01	0.07	0.06
ΔX	−0.54	−0.35	−0.13	0.91	0.69	1.11	1.03	0.95
%N	100	99.65	96.94	89.60	64.64	99.45	98.13	96.18
%M	99.95	99.17	94.90	78.72	57.42	99.96	95.41	89.09

Source: Own calculations based on ECV, 2008
A: Age, R: Region, FT: Full-time, SE: Self-employed, C: Couple, SL: Schooling Level
Standard errors for ΔO in parenthesis

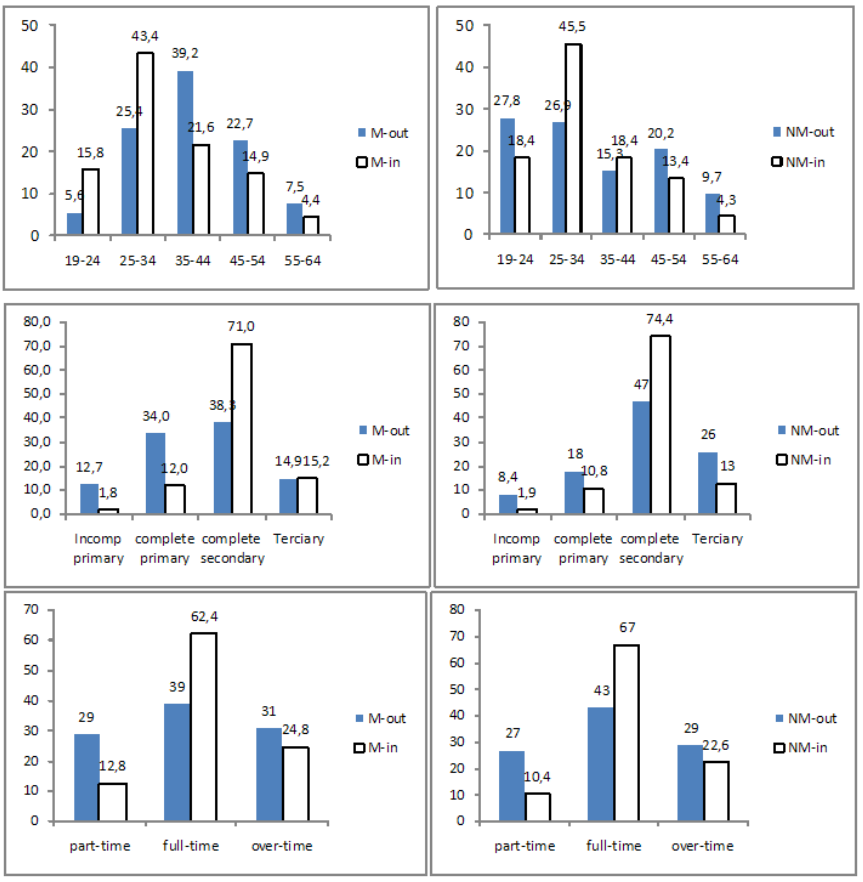

Figure 1: Mothers in and out of the Common Support

workers belonging to the unmatched groups is higher than the proportion of self-employed matched women.

Additional estimations were done using the traditional Blinder-Oaxaca decomposition. As Ñopo (2008) points out "matching is equivalent to Blinder-Oaxaca when the estimations of the earnings equations for males and females are restricted to the common support and performed with the same matching variables and all their possible powers and interactions. We should therefore expect similar results from both" (page 297). Our results are, indeed, quite similar to those obtained with the matching method (Table 7): the unexplained part of the gap (coefficients) declines considerably once schooling is added to the estimation. Even more, the wage gap is no longer significant once schooling is included.

Table 7: **Results of Blinder - Oaxaca decomposition**

	18-65				
	A& R	+ FT	+SE	+C	+SL
Gap	$-0.121**$	$-0.198***$	$-0.204***$	$-0.236***$	-0.021
%	1.61%	2.54%	2.62%	3.03%	0.26%
Endowments	$0.187**$	0.012	0.014	0.030	0.032
Coefficients	$-0.145***$	$-0.215***$	$-0.224***$	$-0.276***$	-0.040
Interactions	-0.005	0.005	0.006	0.009	-0.013

***p<0.001, **p<0.01, *p<0.05.
Source: Own calculations based on ECV, 2008
A,R, FT, SE,C and SL defined as before.

6 Conclusions

The analysis of wage gaps in developing countries is an interesting issue because of the structure of their labor markets (evidence of segmented labor market) and the existence of high inequalities in terms of human capital and income. The aim of this paper is to provide new evidence of the wage differences between mothers and non-mothers for Colombia. We find that the children wage penalty estimated by Peña and Olarte (2011), 9.4%, is much higher than the one we obtain (1.73%) by using the matching procedure to decompose the gap. The explanation of such a difference is that the method we are using here considers the differences in the supports of the distributions of characteristics for mothers and non-mothers. Ignoring these differences - as in the Blinder-Oaxaca method - actually leads to an overestimation of the wage gap, as the empirical evidence suggests.

The results of the paper show that schooling is the main variable explaining the existing wage gap between mothers and non-mothers. Once this variable is included in the matching procedure, the unexplained part of the gap - the one due to unobservable characteristics and potential discrimination - reduces considerably and turns non significant. That is, there is no evidence of wage discrimination against women with children in the Colombian labor market.

Another socioeconomic characteristic of mothers driving the results is their higher probability of being self-employed. Mothers are more likely to work by their own, in order to have greater time flexibility. This constitutes a trade-off between higher flexibility and higher wages. If mothers have lower elasticity of labor supply compared to non-mothers, they will be willing to engage in lower paid but more time flexible jobs. Additionally, mothers have lower schooling levels than women with no children, which limit their capacity to aspire to higher paid jobs.

In summary, there is no evidence of the relevance of unobservable factors (maybe discrimination) explaining the wage gap between mothers and non-mothers. It is mainly the differences in education levels between these two groups what explains the actual wage gap. This is not an obvious remark, since

the existing literature, as it was pointed out in section 2, has been suggesting the potential relevance of unexplained factors determining the earning differences between women with and without children. What we emphasize here is that those differences are mainly explained by observable socioeconomic characteristics of women.

Our results also enrich the current discussion about labor legislation. Some entities from the public sector in Colombia have been proposing to allow women to re-arrange their working day - e.g. start working one hour earlier each day-, in order to make easier for women with children to carry out their home activities. In fact, introducing flexibility would allow mothers to apply to this kind of job positions, not being forced to accept lower salaries than men or non-mothers.

Appendix

Table 8: **Results of the matching wage gap decomposition with no correction of the Selection bias**

				18 - 45 years				
	A& R	+ FT	+SE	+C	+SL	A,R & SL	+ FT	+SE
	(1)	(2)	(3)	(4)	(5)	(1')	(2')	(3')
Gap	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57
ΔO	4.13	2.90	3.36	4.28	0.28	−0.10	−0.13	0.07
ΔN	−0.13	−0.55	−0.97	−1.29	0.09	0.26	0.35	0.11
ΔM	0.09	0.26	0.78	0.57	2.09	1.21	1.09	1.97
ΔX	−1.52	−0.04	−0.60	−0.98	0.08	1.20	1.25	0.41
%N	96.3	88.9	80.2	60.3	32.6	83.4	67.3	52.2
%M	93.6	80.9	62.4	36.3	16.2	57.5	42.5	30.4
				18 - 65 years				
Gap	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45
ΔO	3.30	2.39	3.13	4.04	0.10	−0.08	−0.24	0.19
ΔN	−0.19	−0.38	−0.86	−1.26	0.43	0.54	0.94	0.42
ΔM	0.02	0.18	0.57	0.58	2.06	0.96	0.77	1.76
ΔX	−0.68	0.27	−0.39	−0.90	−0.14	1.03	0.98	0.07
%N	96.7	90.5	81.2	60.6	30.6	83.1	66.2	49.1
%M	91.6	78.2	59.1	35.4	14.5	56.3	40.1	27.2
	A& FT	+SE	+C	+SL	+R	A & SL	+ FT	+SE
ΔO	3.31	3.04	2.81	0.11	0.10	0.26	−0.14	−0.20
ΔN	.	−0.08	−0.32	0.23	0.43	0.07	0.07	0.20
ΔM	0.001	0.05	0.29	1.06	2.06	0.25	0.34	0.83
ΔX	−0.87	−0.55	−0.32	1.04	−0.14	1.18	2.17	1.62
%N	100	99.5	93.9	79.9	30.6	98.5	96.5	92.8
%M	99.9	98.4	90.1	57.1	14.5	95.6	90.6	77.5

Source: Own calculations based on ECV, 2008 A: Age, R: Region, FT: Full-time, SE: Self-employed, C: Couple, SL: Schooling Level

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